

WATERPROOF CONTACT

The present invention relates to a micro-contact resistant to liquid environments. In particular, the present invention relates to a waterproof contact suitable for mounting in
5 hearing instruments.

One of the parameters affecting the lifetime and operability of a hearing instrument is e.g. liquid penetrating the housing of the hearing instrument. Penetration of liquids - e.g. water
- into e.g. electrical contacts will typically result in malfunctions of the hearing instrument.
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It is an object of the present invention to provide a waterproof contact suitable for mounting in hearing instruments.

The above-mentioned object is complied with by providing a waterproof contact
15 comprising

- a base plate,
- a side-wall extending from the base plate in a substantially vertical direction so as
20 to form a housing, said housing having an opening essentially opposite to the base plate,
- a first and a second outer terminal penetrating the base plate so as to form a first and a second contact area on an inner surface of the base plate,
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- a movable knob being adapted to be moved in a direction substantially perpendicular to a plane defined by the inner surface of the base plate, the movable knob comprising a bottom part positioned in the housing, a top part positioned outside the housing, and a middle part connecting said bottom and top
30 part, the middle part being positioned in the opening of the housing,
- an electrical conductor attached to said bottom part for providing electrical contact between said terminals, and

- sealing means for providing a waterproof seal between said housing and said movable knob.

The contact may further comprise a flexible encapsulation enclosing the parts of the
 5 movable knob extending outside the housing and the covering part of an upper surface of the housing. The flexible encapsulation may in principle be fabricated from any rubber like material - like e.g. a thermoplastic elastomer.

The waterproof contact may further comprise an elastic member for loading the movable
 10 knob in a direction away from the base plate. Preferably, the elastic member comprises a spring positioned between the base plate and the movable knob.

The sealing means may be positioned around the sidewall and/or between the top part of the knob and an upper surface of the housing.

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The sealing means may be formed by the above-mentioned thermoplastic elastomer, but in a preferred embodiment, the sealing means comprises annular member, such as an o-ring, positioned around said middle part and between said top part and an upper surface of the housing. Preferably, the top part has a larger circumference than the middle part, so
 20 that the o-ring is positioned below the "neck" provided at the location between the middle part and top part of the knob. Thus, the o-ring provides a waterproof tight seal between the housing and the top part.

Preferably, the o-ring is made of a resilient material, such as silicone or rubber.

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The o-ring can perform the function of the above-mentioned elastic member in case the thickness of the o-ring is large enough to load the knob in a direction away from the base plate, when the o-ring is positioned between the upper surface of the housing and the top part of the knob. Thus, the contact may comprise the spring or the o-ring or both of them

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The electrical conductor may be glued or screwed or welded together with the bottom part of the knob, and the conductor may be formed as a disc or have any other shape for performing the electrical contact between the terminals.

5 The present invention will now be further described in details with reference to the accompanying Figs. 1-9 showing views of a waterproof contact according to the present invention.

The contact has a set of electrically conducting terminals 1. This set of terminals penetrates the base plate 2 in the housing 3 and forms a set of contact areas 4 within the housing. Preferably, the terminals comprise the materials Pd, Ag or Cu or any combination thereof. The base plate 2 is fabricated from a heat resistant material - e.g. polyetheretherketon, and the housing may be fabricated from polyamide and 50% glass.

The contact further comprises a movable knob 8, which is positioned within the opening opposite the base plate 2. The movable knob 8 is adapted to be moved in a direction perpendicular to the surface of the base plate 2 holding the contact area 4. The top part 14 of the movable knob 8 extends out of the opening, the middle part 15 is positioned in the opening, and the bottom part 16 holds a conductor 9 formed as a disc. Preferably, the disc comprises the materials Ag or Ni or any combination thereof. The movable knob 8 itself is fabricated from a plastic like material - preferably polyoxymethylene (POM).

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By pushing the movable knob 8 towards the base plate 2 the conductor 9 short-circuits the contact areas 4 whereby current can flow between the outer terminals 1.

The extending part of the movable knob 8 is encapsulated in a flexible housing 11. The flexible housing 11 is made of a rubber-like material - e.g. a thermoplastic elastomer. The encapsulation may also cover part of the upper surface defined by the sidewall.

Inlets 7 are used for providing the thermoplastic elastomer during the formation of the encapsulation. At the openings of inlets 7 in sidewall 5 the thermoplastic elastomer preferably forms an o-ring extending all around the sidewall 5. In this way the contact can be inserted into a hole in another object and automatically form a waterproof seal so that water is prevented from penetrating through the hole.

In Fig. 2, the top part with the flexible housing 11 has a larger outer diameter than the housing 3. Between the flexible housing 11 and the housing 3, an o-ring may be provided as described above.

Figs. 3-6 show views of another embodiment of the waterproof contact according to the invention.

Fig. 3 shows the base plate 2 that is penetrated by two conducting terminals 1 defining the contact areas 4. The spring 10 is adapted to load the knob 8 in a direction away from the base plate 2.

In Fig. 4 an electrical conductor 9 is positioned on the spring 10. The spring extends into the internal part of the rod 13 having an external thread.

In Fig. 5 the movable knob 8 is screwed on to the rod 13. The knob comprises a top part 14, a middle part 15 and a bottom part 16.

In Fig. 6 the housing 3 is positioned around the base plate and extends upwards therefrom for surrounding the electrical conductor (not shown). The housing comprises an upper flange/surface 17.

Fig. 7 shows two embodiments of the contact shown in Figs. 3-6; one having a housing 3 with an upper surface 17 and one having a housing 3 without said upper flange/surface.

Fig. 8 shows the contact in a transparent and assembled view.

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Fig. 9 show a contact wherein an o-ring 18 is positioned around the middle part 15 between the top part 14 of the knob 8 and the upper flange/surface 17 of the housing 11. The o-ring provides a waterproof seal between the housing and the knob. Furthermore, the o-ring ensures that the knob is pulled away from the base plate, when the contact is not activated. The o-ring is made of a resilient material, so that it is possible to move the knob downwards and thus compress the o-ring.

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